

## MATERIAL AND EQUIPMENT

### 1.1 SECTION INCLUDES

- A. Description
- B. Substitutions
- C. *Manufacturer's Written Instructions*
- D. Transportation and Handling
- E. Storage, Protection and Maintenance
- F. *Manufacturer's Field Quality Control Services*
- G. Post Startup Services
- H. Special Tools and Lubricating Equipment
- I. Lubrication

### 1.2 DESCRIPTION

- A. Proposed Manufacturers List: Within 15 calendar days of the date of the Notice to Proceed, submit to the ENGINEER a list of the names of proposed manufacturers, material, men, suppliers and subcontractors, obtain approval of this list by OWNER prior to submission of any working drawings. Upon request submit evidence to ENGINEER that each proposed manufacturer has manufactured a similar product to the one specified and that it has previously been used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.
- B. Furnish and install Material and Equipment which meets the following:
  - 1) Conforms to applicable specifications and standards.
  - 2) Complies with size, make, type, and quality specified or as specifically approved, in writing, by ENGINEER.
  - 3) Will fit into the space provided with sufficient room for operation and maintenance access and to properly connect to piping, ducts and services as applicable. Make all provisions for installing equipment furnished at no increase in Contract Price.
  - 4) Manufactured and fabricated in accordance with the following:
    - a. Design, fabricate, and assemble in accordance with best engineering and shop practices.
    - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
    - c. Provide two or more items of same kind identical, by same manufacturer.
    - d. Provide materials and equipment suitable for service conditions.

- e. Adhere to equipment capabilities, sizes, and dimensions shown or specified unless variations are specifically approved, in writing, in accordance with the Contract Documents.
  - f. Adapt equipment to best economy in power consumption and maintenance. Proportion parts and components for stresses that may occur during continuous or intermittent operation, and for any additional stresses that may occur during fabrication or installation.
  - g. Working parts are readily accessible for inspection and repair, easily duplicated and replaced.
- 5) Use material or equipment only for the purpose for which it is designed or specified.

### 1.3 SUBSTITUTIONS

#### A. Substitutions:

- 1) CONTRACTOR'S requests for changes in equipment and materials from those required by the Contract Documents are considered requests for substitutions and are subject to CONTRACTOR'S representations and review provisions of the Contract Documents when one of following conditions are satisfied:
  - a) Where request is directly related to an "or equal" clause or other language of same effect in Specifications.
  - b) Where required equipment or material cannot be provided within Contract Time, but not as result of CONTRACTOR'S failure to pursue Work promptly or to coordinate various activities properly.
  - c) Where required equipment or material cannot be provided in manner compatible with other materials of Work, or cannot be properly coordinated therewith.
- 2) CONTRACTOR'S Options:
  - a) Where more than one choice is available as options for CONTRACTOR'S selection of equipment or material, select option compatible with other equipment and materials already selected (which may have been from among options for other equipment and materials).
  - b) Where compliance with specified standard, code or regulation is required, select from among products which comply with requirements of those standards, codes, and regulations.
  - c) "or approved equal": For equipment or materials specified by naming one or more equipment manufacturer and "or equal", submit request for substitution for any equipment or manufacturer not specifically named.

B. Conditions Which are Not Substitution:

- 1) Requirements for substitutions do not apply to CONTRACTOR options on materials and equipment provided for in the Specifications.
- 2) Revisions to Contract Documents, where requested by OWNER or ENGINEER, are "changes" not "substitutions".
- 3) CONTRACTOR'S determination of and compliance with governing regulations and orders issued by governing authorities do not constitute substitutions and do not constitute basis for a Change Order, except as provided for in Contract Documents.

#### 1.4 MANUFACTURER'S WRITTEN INSTRUCTIONS

A. *Instruction Distribution:* When the Contract Documents require that installation, storage, maintenance and handling of equipment and materials comply with manufacturer's written instructions, obtain and distribute printed copies of such instructions to parties involved in installation, including six copies to ENGINEER.

- 1) Maintain one set of complete instructions at jobsite during storage and installation, and until completion of work.

B. *Manufacturer's Requirements:* Store, maintain, handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's written instructions and in conformity with Specifications.

- 1) Should job conditions or specified requirements conflict with manufacturer's instructions, consult ENGINEER for further instructions.
- 2) Do not proceed with work without written instructions.

C. *Performance Procedures:* Perform work in accordance with manufacturer's written instructions. Do not omit preparatory steps or installation procedures, unless specifically modified or exempted by Contract Documents.

#### 1.5 TRANSPORTATION AND HANDLING

A. *Coordination with Schedule:* Arrange deliveries of materials and equipment in accordance with Construction Progress Schedules. Coordinate to avoid conflict with work and conditions at site.

- 1) Deliver materials and equipment in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
- 2) Protect bright machined surfaces, such as shafts and valve faces, with a heavy coat of grease prior to shipment.

- 3) Immediately upon delivery, inspect shipments to determine compliance with requirements of Contract Documents and approved submittals and that material and equipment are protected and undamaged.
- B. Handling: Provide equipment and personnel to handle material and equipment by methods recommended by manufacturer to prevent soiling or damage to materials and equipment or packaging.

## 1.6 STORAGE, PROTECTION, AND MAINTENANCE

A. On-site storage areas and buildings:

- 1) Coordinate location of storage areas with ENGINEER and OWNER.
- 2) Arrange on site storage areas for proper protection and segregation of stored materials and equipment with proper drainage. Provide for safe travel around storage areas and safe access to stored materials and equipment.
- 3) Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- 4) Store materials such as pipe, reinforcing and structural steel, and equipment on pallets, blocks or racks, off ground.
- 5) Store fabricated materials and equipment above ground, on blocking or skids, to prevent soiling or staining. Cover materials and equipment which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

B. Interior Storage:

- 1) Store materials and equipment in accordance with manufacturer's instructions, with seals and labels intact and legible.
- 2) Store materials and equipment, subject to damage by elements, in weathertight enclosures.
- 3) Maintain temperature and humidity within ranges required by manufacturer's instructions.

C. Accessible Storage: Arrange storage in a manner to provide easy access for inspection and inventory. Make periodic inspections of stored materials or equipment to assure that materials or equipment are maintained under specified conditions and free from damage or deterioration.

- 1) Perform maintenance on stored materials or equipment in accordance with manufacturer's instructions, in presence of OWNER or ENGINEER.
- 2) Submit a report of completed maintenance to ENGINEER with each Application for Payment.

- 3) Failure to perform maintenance, to notify ENGINEER of intent to perform maintenance or to submit maintenance report may result in rejection of material or equipment.
- D. OWNER'S Responsibility: OWNER assumes no responsibility for materials or equipment stored in buildings or on-site. CONTRACTOR assumes full responsibility for damage due to storage of materials or equipment.
- E. CONTRACTOR'S Responsibility: CONTRACTOR assumes full responsibility for protection of completed construction. Repair and restore damage to completed Work equal to its original condition.
- F. Special Equipment: Use only rubber tired wheelbarrows, buggies, trucks, or dollies to wheel loads over finished floors, regardless if the floor has been protected or not. This applies to finished floors and to exposed concrete floors as well as those covered with composition tile or other applied surfacing.
- G. Surface Damage: Where structural concrete is also the finished surface, take care to avoid marking or damaging surface.

#### 1.7 MANUFACTURER'S FIELD QUALITY CONTROL SERVICES

- A. General:
  - 1. Provide manufacturer's field services in accordance with this subsection for those tasks specified in other sections.
  - 2. Include and pay all costs for suppliers' and manufacturers' services, including, but not limited to, those specified.
- B. Installation Instruction: Provide instruction by competent and experienced technical representatives of equipment manufacturers or system suppliers as necessary to resolve assembly or installation procedures which are attributable to, or associated with, the equipment furnished.
- C. Installation Inspection, Adjustments and Startup Participation:
  - 1. Provide competent and experienced technical representatives of equipment manufacturers or system suppliers to inspect the completed installation as follows.
    - a) Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions which may cause damage.
    - b) Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
    - c) Verify that wiring and support components for equipment are complete.

- d) Verify that equipment or system is installed in accordance with the manufacturer's recommendations, approved shop drawings and the Contract Documents.
  - e) Verify that nothing in the installation voids any warranty.
- 2. Provide manufacturer's representatives to perform initial equipment and system adjustment and calibration conforming to the manufacturer's recommendations and instructions, approved shop drawings and the Contract Documents.
- 3. Obtain ENGINEER'S approval before start-up of equipment. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.
- 4. Furnish ENGINEER with three copies of the following. When training is specified, furnish the copies at least 24 hours prior to training.
  - a) "Certificate of Installation, Inspection and Start-up Services" by manufacturers' representatives for each piece of equipment and each system specified, certifying:
    - 1) That equipment is installed in accordance with the manufacturers' recommendations, approved shop drawings and the Contract Documents.
    - 2) That nothing in the installation voids any warranty.
    - 3) That equipment has been operated in the presence of the manufacturer's representative.
    - 4) That equipment, as installed, is ready to be operated by others.
  - b) Detailed report by manufacturers' representatives, for review by ENGINEER of the installation, inspection and start-up services performed, including:
    - 1) Description of calibration and adjustments if made; if not in Operation and Maintenance Manuals, attach copy.
    - 2) Description of any parts replaced and why replaced.
    - 3) Type, brand name, and quantity of lubrication used, if any.
    - 4) General condition of equipment.
    - 5) Description of problems encountered, and corrective action taken.
    - 6) Any special instructions left with CONTRACTOR or ENGINEER.
- D. Field Test Participation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to participate in field testing of the equipment.

- E. Trouble-Free Operation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to place the equipment in trouble-free operation after completion of start-up and field tests.

#### 1.8 POST START-UP SERVICES

- A. General: Provide Post Start-up Services in accordance with this subsection for equipment specified in other sections.
- B. Site Visit: Provide the services of an authorized service representative for each equipment manufacturer or system supplier to make a final site visit after the equipment or system has been in operation for at least 6 months, but no longer than 11 months. Furnish assistance to OWNER's operating personnel in making adjustments and calibrations required to determine that the equipment and system is operating in conformance with design, manufacturer's, and specification requirements. Instruct the personnel in a review of proper operation and maintenance procedures.
- C. Certificate: Furnish "Certificate of Post Start-up Services" cosigned by ENGINEER and the manufacturer's representative, certifying that this service has been performed. Use form provided in this section, and furnish OWNER with three copies.

#### 1.9 SPECIAL TOOLS AND LUBRICATING EQUIPMENT

- A. General: Furnish, per manufacturer's recommendations, special tools required for checking, testing, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics.)
- B. Time of Delivery: Deliver special tools and lubricating equipment to OWNER when unit is placed into operation and after operating personnel have been properly instructed in operation, repair, and maintenance of equipment.
- C. Quality: Provide tools and lubricating equipment of a quality meeting equipment manufacturer's requirements.

#### 1.10 LUBRICATION

- A. General: Where lubrication is required for proper operation of equipment, incorporate in the equipment the necessary and proper provisions in accordance with manufacturer's requirements. Where possible, make lubrication automated and positive.
- B. Oil Reservoirs: Where oil is used, supply reservoir of sufficient capacity to lubricate unit for a 24-hour period.

**END OF SECTION**

## CERTIFICATE OF INSTALLATION, INSPECTION AND START-UP SERVICES

Project \_\_\_\_\_

Equipment \_\_\_\_\_

Specification Section \_\_\_\_\_

Contract \_\_\_\_\_

I hereby certify that the named equipment has been inspected, adjusted and operated by the Manufacturers' Representative and further certify:

1. That the equipment is installed in accordance with the manufacturer's recommendations, approved shop drawings and the Contract Documents.
2. That nothing in the installation voids any warranty.
3. That equipment has been operated in the presence of the manufacturer's representative.
4. That equipment, as installed, is ready to be operated by others.

### MANUFACTURERS' REPRESENTATIVE

Signature \_\_\_\_\_ Date \_\_\_\_\_

Name (print) \_\_\_\_\_

Title \_\_\_\_\_

Representing \_\_\_\_\_

CONTRACTOR



Signature\_\_\_\_\_Date \_\_\_\_\_

Name (print)\_\_\_\_\_

Title\_\_\_\_\_

Attach the detailed report called for by the “Materials and Equipment” specification.

Complete and submit three copies of this form with the detailed report to ENGINEER as specified.

## CERTIFICATE OF POST START-UP SERVICES

Project \_\_\_\_\_

Equipment \_\_\_\_\_

Specification Section \_\_\_\_\_

Contract \_\_\_\_\_

I hereby certify the Manufacturers' Representative has inspected this equipment, made adjustments and calibrations, and that it is operating in conformance with the design, specifications, and manufacturer's requirements. Detailed notation of improper operation with corresponding recommendations, if any, are made and attached to this form.

### MANUFACTURER'S REPRESENTATIVE

Signature \_\_\_\_\_ Date \_\_\_\_\_

Name (print) \_\_\_\_\_

Title \_\_\_\_\_

Representing \_\_\_\_\_

### CONTRACTOR

Signature \_\_\_\_\_ Date \_\_\_\_\_

Name (print) \_\_\_\_\_

Title \_\_\_\_\_

ENGINEER

Signature \_\_\_\_\_ Date \_\_\_\_\_

Name (print) \_\_\_\_\_

Title \_\_\_\_\_

COMMENTS:

Complete and submit three copies of this form to OWNER upon completion of 6 to 11 months reinspection as required by the "Materials and Equipment" specification.

## PROPOSED DETENTION POND

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## DETENTION POND BIDDING INSTRUCTIONS

This set of plans provides the specification for two alternate methods of constructing the detention pond. The contractor is instructed to provide bids for the alternate of their choice, and to leave the remaining option blank.

The alternates address the type of impervious layer that will be used in the detention pond. Alternate 1 uses a two foot thick clay layer, with a four inch topsoil layer, and Alternate 2 uses a one foot thick clay layer in conjunction with a geosynthetic layer, capped by a one foot topsoil layer.

The final bids will be tabulated using the Alternate that was filled out by the contractor. If bids are included for both Alternates, the total bid price will include both items.

SECTION 02262A  
SOIL-BENTONITE (S-B) SLURRY TRENCH

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- 1.9 QUALITY CONTROL TESTING
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PART 2 PRODUCTS

## 2.1 MATERIALS

- 2.1.1 Bentonite
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- 2.1.3 Backfill Material

## 2.2 EQUIPMENT

- 2.2.1 Trench Excavation Equipment
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- 2.2.3 Field Laboratory Equipment

## 2.3 BENTONITE SLURRY MIXES

- 2.3.1 Initial Bentonite Slurry Mixture
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## PART 3 EXECUTION

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### 3.2 WORKING SURFACE

### 3.3 SLURRY TRENCH EXCAVATION

- 3.3.1 Confining Stratum Excavation

### 3.4 SLURRY PLACEMENT AND TESTING

- 3.4.1 Slurry Placement
- 3.4.2 Slurry Testing

### 3.5 EXCAVATED MATERIAL

### 3.6 STABILITY

- 3.6.1 Backfill of 24" Force Main and 42" Concrete Pipe Through the Slurry Wall

### 3.7 TRENCH CLEANING

### 3.8 S-B BACKFILL MIXING AND PLACEMENT

- 3.8.1 Mixing
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### 3.9 SOUNDINGS

- 3.9.1 Elevation of Top of Confining Stratum
- 3.9.2 Elevation of Trench Bottom Prior to Backfilling
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### 3.10 AS-BUILT PROFILE

3.11 TREATMENT OF TOP OF SLURRY TRENCH

3.12 CLEAN-UP



SECTION 02262A  
SOIL-BENTONITE (S-B) SLURRY TRENCH

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API RP 13B-1                      (1997; A 2000) Standard Procedure for  
Field Testing Water-Based Drilling Fluids

API Spec 13A                      (1993; A 1999) Drilling-Fluid Materials

ASTM INTERNATIONAL (ASTM)

ASTM C 143/C 143M              (2003) Slump of Hydraulic Cement Concrete

ASTM D 1140                      (2000) Amount of Material in Soils Finer  
than the No. 200 (75-micrometer) Sieve

ASTM D 2216                      (1998) Laboratory Determination of Water  
(Moisture) Content of Soil and Rock by Mass

ASTM D 422                      (1963; R 2002) Particle-Size Analysis of  
Soils

ASTM D 4318                      (2000) Liquid Limit, Plastic Limit, and  
Plasticity Index of Soils

ASTM D 5084                      (2000e1) Measurement of Hydraulic  
Conductivity of Saturated Porous Materials  
Using a Flexible Wall Permeameter

ASTM D 698                      (2000a) Laboratory Compaction  
Characteristics of Soil Using Standard  
Effort (12,400 ft-lbf/cu. ft.)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020              1983) Methods for Chemical Analysis of  
Water and Wastes

## 1.2 MEASUREMENT AND PAYMENT

### 1.2.1 Measurement

Measurement for S-B Slurry Trench shall be based on the area in square feet of completed slurry trench measured in a vertical plane through the centerline of the slurry trench, from the top of the working surface to the bottom of the excavated trench, and vertical lines at each corner of the full depth of the excavated trench. Measurement shall be based on surveys and soundings taken at the site as directed and approved by the Engineer.

### 1.2.2 Payment

Payment for S-B Slurry Trench will be made at the contract unit price per square foot. Such price will include costs incurred for the construction and completion of the slurry trench. No separate payment will be made for material, equipment, handling and cleaning the slurry, quality control testing, record keeping, and site preparation including construction of the working surface.

## 1.3 DEFINITIONS

The terms used in this Section are defined as follows:

### 1.3.1 Slurry Trench

The slurry trench is a 3 foot minimum width trench excavated through the existing ground or prepared working surface using the slurry method of excavation and backfilled with S-B backfill material to form a low permeability cutoff wall.

### 1.3.2 Slurry Method of Excavation

The slurry method of excavation consists of excavating a vertical walled trench and at the same time keeping the trench filled with a bentonite slurry mixture. The purpose of the slurry is to support the walls of the trench and prevent movement of ground water.

### 1.3.3 Bentonite

Bentonite is an ultrafine natural clay whose principal mineral constituent is sodium cation montmorillonite.

### 1.3.4 Slurry

Slurry is a colloidal mixture of bentonite and water.

### 1.3.5 Soil Bentonite (S-B) Backfill

S-B backfill is a homogeneous mixture of material produced by mixing soil with bentonite slurry and additional dry bentonite, which is placed into the excavated trench to complete the soil-bentonite slurry trench.

### 1.3.6 Ground Water Level

The ground water level is the piezometric level of the ground water as determined from piezometers and wells.

### 1.3.7 Working Surface

The working surface is the top of the stripped and/or prepared natural ground slurry trench shall be constructed.

#### 1.3.8 Confining Stratum

The confining stratum is the soil stratum or rock unit to or into which the bottom of the slurry trench is excavated.

### 1.4 PERFORMANCE REQUIREMENTS

The Engineer may perform quality assurance testing on representative samples obtained by the Contractor of the bentonite slurry and S-B backfill using the laboratory and equipment furnished by the Contractor. The Engineer testing will in no way relieve the Contractor of the responsibility of performing tests necessary to meet the Construction Quality Control (CQC) requirements. The Contractor shall provide the equipment and laboratory space to Engineer personnel on demand and these services shall be considered a subsidiary obligation of the soil bentonite slurry trench construction. All routine testing procedures being conducted by the Contractor shall be available for inspection by the Engineer at any time.

### 1.5 SUBMITTALS

The approval of Robinson Engineering, Ltd., the Project Engineer is required for submittals with a "R" designation; submittals not having a "R" designation are for Contractor Quality Control approval. The following shall be submitted.

#### SD-01 Preconstruction Submittals

##### Preconstruction Testing Plan; "R"

Plan providing a list of test equipment, procedures, and materials to be used to develop the mix design for the S-B backfill.

##### Slurry Trench Implementation Plan; "R"

Plan describing the general work sequence and layout of operations. The layout of operations shall include scale drawings, which depict slurry and S-B backfill preparation and storage areas. The plan shall describe Contractor qualifications, equipment, method of trench excavation, use or disposal of excavated material, bottom cleaning, slurry preparation and maintenance, S-B backfill preparation and placement, and site clean-up. The plan shall provide a description of quality control equipment and test procedures, sample test forms for reporting test results, and the offsite laboratory proposed for use.

The Contractor shall submit data on the equipment to be used in the construction of the slurry trench; equipment to be used to obtain impervious stratum samples; equipment to be used to obtain record control samples of the completed slurry trench; and equipment to be used in the Contractors quality control testing.

#### SD-02 Shop Drawings

##### As-Built Profile

A scale drawing providing a log of the subsurface materials excavated from the trench, and a profile of the completed slurry trench. The limits of each batch of S-B backfill shall be delineated as placed.

#### SD-04 Samples

**Bentonite; "R"**

A minimum of 10 pounds of the proposed bentonite at least 1 month prior to use.

**Backfill Material; "R"**

A minimum of 50 pounds of each type of proposed borrow soil at least 1 month prior to use.

**SD-06 Test Reports**

**S-B Backfill Test Report**

A report summarizing the procedures and results of the Pre-construction S-B backfill mix tests. The report shall include a description of mix proportions, gradations, slumps, densities, permeabilities, and moisture contents of 3 samples of the final S-B backfill mix using the bentonite and backfill materials proposed for use.

**Quality Control Testing**

The results from quality control testing.

**Soundings**

A record of soundings and measurements taken during construction of the slurry trench.

**Water**

A record of the water source and associated chemical analysis.

**Bentonite Slurry Mixes**

**Slurry Properties**

A record of bentonite slurry mix quantities, proportions of additives utilized, and adjustments for each batch.

**SD-07 Certificates**

**Bentonite; "R"**

A copy of the test results from the bentonite manufacturer for each lot shipped to the site and a certificate of compliance stating that the bentonite complies with applicable standards.

**1.6 QUALIFICATIONS**

**1.6.1 Contractor**

The Contractor shall have successfully installed a minimum area of 1,000,000 square feet. The qualifications and experience of personnel who shall be responsible for conducting the operations shall include references (name and telephone number) of the owners of the Contractor's previous slurry trench construction projects.

### 1.6.2 Slurry Trench Specialist

The slurry trench specialist shall be an individual who has had experience with at least 5 projects in all aspects of slurry trench construction which includes, but is not limited to:

- a. The use, testing, and control of bentonite slurries,
- b. The mixing methods required to properly mix the slurry and backfill materials as required,
- c. Trench excavation and backfilling procedures, and
- d. A thorough knowledge of construction equipment and material testing required for slurry trench construction.

### 1.6.3 Slurry Trench Excavation Equipment Operator

The slurry trench excavation equipment operator shall have experience using similar slurry trench excavation equipment to be used for this contract in a minimum of 2 projects of similar or greater magnitude (minimum depth of 35 feet).

## 1.7 DELIVERY, STORAGE, AND HANDLING

Materials delivered and placed in storage shall be protected from the weather, dirt, dust or other contaminants.

## 1.8 GEOTECHNICAL SITE CONDITIONS

### 1.8.1 Exploratory Borings

Subsurface exploratory borings have been obtained by the Project Geotechnical Engineer, SEECO Consultants, Inc. to determine the character of materials to be excavated. Locations of the borings are shown on the drawings and the logs of those borings, which fall within the area of this contract, are included in the back of the project specifications for the convenience of the Contractor. The geotechnical engineer assumes no responsibility for interpretation or deductions made by the Contractor from the logs and borings. Local minor variations may exist in the subsurface materials between boring locations and, if encountered, will not be considered as being materially different within the purview of this contract. Soils classifications shown on the logs are the result of laboratory classifications in accordance with the AASHTO Soil Classifications System. The results of all laboratory testing, including rock and soil, are available for review by the Contractor in the back of the project specifications:

### 1.8.2 Subsurface Conditions

The general soils encountered at the project site consist of relatively high permeability (average  $K=1.3 \times 10^{-3}$  cm/s) cohesionless soils consisting of loose to medium dense brown and gray to gray sandy loam to loose to dense brown and gray to gray sand were encountered approximately in the upper 25 to 35 feet of the soil borings. Less permeable soils consisting of medium dense to very dense gray silt to silty loam to sandy silt were encountered below the above mentioned sand strata at approximately 25 to 35 feet below the existing ground level. Underlying the above mentioned silt stratum, soils generally consist of very dense gray silty sand and gravel to gravel to silty sand with occasional cobbles and boulders. Dolomite Bedrock underlies the above mentioned material at approximately 576.0 M.S.L. The S-B slurry wall should be constructed to an approximate depth of 35 feet below the existing ground level (with slurry wall bottom elevations ranging from 583 M.S.L. to 597 M.S.L.) and should be imbedded approximately 2 feet into the dense to very dense gray silt to silty loam material.